

Transforming Teacher Preparation Through Simulation-Driven Learning and the Open edX® platform

University of Virginia and TeachSim



Introduction

Teacher preparation programs face a critical "practice gap," leaving novice educators to manage classrooms with minimal hands-on rehearsal. Historically, traditional teacher training relies heavily on theoretical lecture-style courses and unpredictable clinical placements. These traditional environments often provide high-stakes experiences with real students, limited opportunities for "do-overs," and inconsistent feedback that depends heavily on the quality of a mentor teacher.

To address this, researchers and data scientists at the University of Virginia (UVA) developed **TeachSim**, a specialized teacher learning platform built on top of the **Open edX** architecture. Designed to support deliberate practice, automated coaching, and instructional skill development, TeachSim bridges the gap between knowing pedagogical theory and executing it successfully in a live classroom.



The Challenge

Traditional models of teacher preparation struggle to provide safe, scalable rehearsal opportunities before new teachers step in front of live students. Key challenges include:

- **The Practice Gap:** Novice teachers—particularly those coming through alternative certification routes or emergency credentialing programs—frequently step into classrooms responsible for dozens of students with little to no prior practice.
- **High-Stakes Clinical Placements:** Traditional student-teaching placements involve real students, meaning mistakes carry real consequences for student learning, restricting the freedom to make mistakes and learn from "do-overs".
- **Inconsistent Mentorship:** The quality of feedback in traditional student-teaching models relies heavily on the individual mentor teacher, leading to wide disparities in preparedness.
- **Scaling and Logistics Bottlenecks:** Earlier iterations of TeachSim relied on mixed-reality simulations powered by human actors behind the virtual scenes. While effective, this human-powered model proved too costly, labor-intensive, and difficult to scale across large cohorts.



The Solution

To overcome scaling barriers and expand access, UVA leveraged the Open edX platform (in partnership with Edly and simulation-technology partner Mursion) to build a fully automated, simulation-driven teacher training ecosystem. By transitioning to generative AI-powered simulations and coaching, TeachSim implemented the following strategic solutions:

- **A Structured "TeachSim" Pedagogy Model:** The platform organizes learning into a strict three-phase loop:
 1. **Pre-Teach:** Educators build foundational knowledge and internalize specific curricula or lesson plans.
 2. **Teach:** Teachers practice targeted instructional skills with realistic student avatars, receiving immediate, rubric-aligned AI coaching and opportunities for repeated practice loops.
 3. **Post-Teach:** Educators reflect on their performance, respond to targeted prompts, and plan for real-world classroom transfer.
- **Modular Course Architecture:** the Open edX platform provided a mature, modular learning ecosystem that aligned perfectly with TeachSim's multi-phase course design, clear learner pathways, and engagement tracking.
- **Seamless Third-Party Integration:** Using Open edX features like single sign-on (SSO), SCORM integrations, and customizable XBlocks (such as the AI coach XBlock), the team rapidly scaled feature expansion and automated simulation workflows.

Strategic Implementation

UVA's adoption and rollout of TeachSim involved several core execution steps:

- **Piloting with Key Partners:** Initial platform pilots were deployed with partners like the University of Virginia and residency programs, targeting early-career induction support (years zero to three in the classroom).
- **Automating Simulation and Coaching:** Leveraging generative AI and Mursion's simulation technology, the platform fully automated student avatar responses and feedback delivery, matching the style of expert human coaches.
- **Aligning with Validated Rubrics:** Simulations and AI feedback were directly mapped to validated observation rubrics measuring core teaching skills, such as probing student strategy and understanding.
- **Leveraging Open-Source Adaptability:** Using an open-source framework allowed a small teacher learning lab to build a custom, long-term implementation that can grow alongside expanding district and state partnerships.



Measurable Results and Impact

Over a decade of systematic research—backed by randomized controlled trials—and recent automated platform deployments have yielded significant positive outcomes:

- **Proven Efficacy of Coaching:** Research confirms that targeted coaching between practice rounds significantly improves teacher performance.
- **Predictive of Real-World Success:** Strong performance in TeachSim simulations reliably translates to strong instructional execution with real children in actual classrooms.
- **Enhanced Scalability:** Automating simulations and coaching with generative AI removed the logistical bottlenecks and high costs of human-actor-driven simulations, allowing for broader dissemination.
- **High User Satisfaction:** Early feedback from participating educators highlights the potency of the platform, with users noting that targeted simulation modules are more valuable than much of traditional professional development.

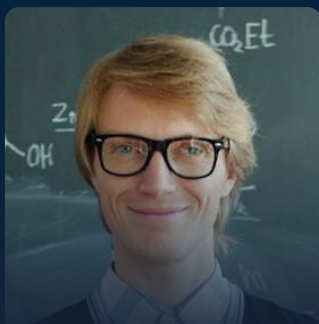


Key Success Factors

- **Grounded in Empirical Research:** A 10-year research base supporting the mechanics of deliberate practice, dosage, and immediate feedback.
- **Leveraging Open-Source Flexibility:** Utilizing the Open edX platform to build a sophisticated, customized application without requiring massive enterprise engineering teams.
- **Focus on Core Teaching Competencies:** Breaking down broad teaching skills into distinct lessons (e.g., providing feedback to a partial response, eliciting student thinking in mathematics).
- **Curricular Relevance:** Grounding simulation scenarios directly in the actual instructional materials teachers use day-to-day.

Future Directions

- **Closing the Loop with Video Observations:** Developing mechanisms to connect simulation performance data directly with classroom video observations to track real-world application.
- **Intelligent Pathway Routing:** Expanding adaptive logic to automatically guide educators to next-level simulations based on their current mastery levels.
- **Expanding Institutional Partnerships:** Scaling adoption by integrating modules into state-level professional learning incentives, district induction programs, and alternative certification pathways.



Advice for Other Institutions

- **Embrace Open-Source Infrastructure:** Utilize robust open-source solutions like the Open edX platform to build specialized, highly customized learning tools efficiently.
- **Target High-Need Transitions:** Focus innovation efforts on early-career induction windows (years zero to three) where teachers experience the highest friction and need for intensive support.
- **Prioritize Actionable Practice Over Pure Theory:** Shift professional learning models away from passive lectures toward active, scaffolded rehearsal environments.



Conclusion

UVA's development of TeachSim via the Open edX platform demonstrates the immense potential of combining learning science with scalable, open-source technology. By replacing high-stakes anxiety with safe, AI-powered deliberate practice, TeachSim is successfully bridging the practice gap in education and equipping a new generation of teachers to thrive.



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The University of Virginia is defined by:

- An enduring commitment to a vibrant and unique residential learning environment marked by the free and collegial exchange of ideas;
- An unwavering support of a collaborative, diverse community bound together by distinctive foundational values of honor, integrity, trust, and respect;
- A universal dedication to excellence and affordable access.

The Organizations that Made this Possible

